

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

HONEYWELL INTERNATIONAL INC.  
and HONEYWELL INTELLECTUAL  
PROPERTIES INC.,

Plaintiffs,

v.

HAMILTON SUNDSTRAND CORP.,

Defendant.

C.A. No. 99-309-GMS

**HAMILTON SUNDSTRAND CORPORATION'S POST-TRIAL  
PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW**

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## INTRODUCTION

Hamilton Sundstrand Corporation (“HSC”) submits these Proposed Findings of Fact and Conclusions of Law. To the extent that any issue of law is deemed to be an issue of fact, it should be so considered, and to the extent that any issue of fact is deemed to be an issue of law it should be so considered. Moreover, HSC incorporates by reference all findings of fact and conclusions of law from its Trial Brief to the extent not explicitly set forth herein. HSC reserves its right to supplement its Proposed Findings of Fact and Conclusions of Law, as necessary.

## SUMMARY OF FINDINGS AND CONCLUSIONS

### **I. The Issue On Remand**

1. The question in this remand proceeding is whether Honeywell can overcome the presumption that it surrendered all equivalents to the inlet guide vane limitation (the “IGV limitation”) that was used to narrow the scope of its patent claims and gain allowance.

*Honeywell Int'l Inc. v. Hamilton Sundstrand Corp.*, 370 F.3d 1131, 1144 (Fed. Cir. 2004) (en banc), *cert. denied*, 125 S.Ct. 2928 (2005).

### **II. The Alleged Equivalent**

2. The alleged equivalent feature Honeywell relied upon at trial was that HSC’s APS 3200 “incorporated” IGV position “into the surge control system” to “efficiently control surge” (*Id.* at 1136) and used IGV position so that the flow-related parameter “was a direct function of inlet guide vane position.” *Honeywell Int'l Inc. v. Hamilton Sundstrand Corp.*, 166 F. Supp. 2d 1008, 1021 (D. Del. 2001).

3. Honeywell now seeks to characterize the alleged equivalent in a different way, that focuses on the APS 3200’s measuring of static pressure in the diffuser of a compressor, which can produce a “double-solution” behavior. This is not what Honeywell presented at trial

and certainly was not supported by the required “particularized evidence and linking argument.” In fact, at trial and before trial, Honeywell asserted that the features it now proffers as the alleged equivalent were not “germane” and “had nothing to do” with infringement. Accordingly, Honeywell’s proposed new characterization of the equivalent must be rejected.

### **III. Unforeseeability**

4. The alleged equivalent features that Honeywell relied upon at trial were known and used in the art prior to 1982. In fact, Honeywell did not even argue that these features were unforeseeable, and its witnesses admitted that they were known in the prior art.

5. As noted, on remand Honeywell has proffered a different characterization of the alleged equivalent, which the Court has rejected. But, in any event, these new alleged equivalent features also were known and foreseeable as of 1982.

### **IV. Tangential Relation**

6. Where the reason for the narrowing amendment and the alleged equivalent involve the “same aspect” of the invention, the rationale underlying the amendment is not merely tangential to the equivalent. *Biagro Western Sales, Inc. v. Grow More, Inc.*, 423 F.3d 1296, 1306 (Fed. Cir. 2005). Further, “if the prosecution history shows no reason” for the amendment, the patentee “cannot claim that the rationale for the amendment is merely tangential.” *Id.*

7. Here, the only rationale that can be discerned from the prosecution history is that Honeywell narrowed its claims by adding the IGV limitation, requiring a specific use of IGV position in the surge control system, to distinguish the prior art and gain allowance. This rationale is not merely tangential to the APS 3200’s allegedly equivalent use of IGV position in a surge control system, because they relate to the “same aspect” of the invention.

8. To the extent Honeywell asks the Court to speculate about other possible reasons for the amendment, that argument fails because the prosecution history shows no other reason.

As noted, an unexplained amendment cannot be shown to be merely tangential to an alleged equivalent. *Id.*; *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 344 F.3d 1359, 1371-72 (Fed. Cir. 2003).

#### V. Other Reason

9. Honeywell's "other reason" arguments are also rejected. First, Honeywell's argument about what a reasonable patent attorney purportedly would have believed in 1982 ignores the proper legal standard and is contrary to the Supreme Court's holding that *Festo* is consistent with reasonable expectations and must be given retroactive effect. Second, Honeywell's argument that a reasonable person would have believed the IGV Limitation was literally satisfied by the APS 3200 fails, because this argument cannot establish "some other reason." If anything, this argument would demonstrate that Honeywell was able to describe the alleged equivalent, but merely chose not to do so.

### FINDINGS OF FACT

#### I. The Parties

10. Honeywell International Inc. ("Honeywell") is a corporation organized and existing under the laws of Delaware with its principal place of business at 101 Columbia Road, Morristown, New Jersey. Honeywell is the successor-in-interest to a corporation known as Allied Signal Inc., which was a successor in interest to the Garrett Corporation. (Stipulation of Uncontested Facts ¶1, D.I. 388)

11. Honeywell Intellectual Properties Inc. is a corporation organized and existing under the laws of Arizona with its principal place of business at 960 W. Elliott Road, Suite 101, Tempe, Arizona. (*Id.* at ¶2)

12. Hamilton Sundstrand Corporation is a corporation organized and existing under the laws of Delaware with its principal place of business at One Hamilton Road, Windsor Locks, Connecticut. HSC's power systems business, which is responsible for its auxiliary power units, is based in San Diego, California. HSC is a wholly-owned subsidiary of United Technologies Corporation. (*Id.* at ¶3)

## **II. The Technology At Issue**

13. This patent infringement case involves patents relating to surge control systems for gas turbine engines, including auxiliary power units ("APUs"). APUs are small gas turbine engines usually located in the tail section of an aircraft. *Honeywell*, 370 F.3d at 1134. They are used to provide compressed air needed both to start the aircraft's main engines and to control the environment of the aircraft's cabin during flight. *Id.*

14. APUs often contain a load compressor, which delivers air to the aircraft. (Japikse, Trial Tr. 234:23-25) The load compressors at issue have inlet guide vanes ("IGVs") that "regulate the amount of flow that passes through the load compressor." (*Id.* at 235:16-19) They also have impellers, which are rotating parts that draw the air flow into the load compressor. (*Id.* at 235:25-236:4) Air flows from the impeller into the load compressor's diffuser section, where the velocity of the air flow is decreased and its pressure increased. (*Id.* at 236:14-16) Air then flows from the diffuser into the scroll, a passage or duct that collects the air and passes it through to the aircraft. (*Id.* at 238:10-25)

15. Where the demand for air flow from the aircraft is low, a compressor may experience "surge." Surge is a "flow instability that occurs when pressure builds up in the main air duct." *Honeywell*, 370 F.3d at 1134. Surge can be detrimental to the performance of the APU.

16. Many APUs, including HSC's APS 3200 APU, thus incorporate surge control systems to prevent a surge condition and damage to the APU. *Id.*

### **III. Procedural History**

17. Honeywell filed this case in May 1999, alleging that the APS 3200 surge control system infringed certain claims of United States Patent Nos. 4,380,893 (the “‘893 patent”) and 4,428,194 (the “‘194 patent”). (D.I. 1)

18. On August 7, 2000, HSC moved for summary judgment of non-infringement. (D.I. 104) On December 6, 2000, HSC filed a separate pretrial motion for summary judgment that Honeywell could not assert the doctrine of equivalents as a result of prosecution history estoppel. (D.I. 175)

19. The Court denied both of HSC's motions for summary judgment. *Honeywell Int'l Inc. v. Hamilton Sundstrand Corp.*, No. 99-309 (GMS), 2001 U.S. Dist. LEXIS 2155, at \*6 (D. Del. Jan. 8, 2001).

20. A jury trial was held in February 2001. At trial, Honeywell asserted infringement of three independent claims: claim 4 of the ‘194 patent and claims 8 and 19 of the ‘893 patent. Honeywell asserted that the APS 3200 infringed claim 4 both literally and under the doctrine of equivalents. Honeywell asserted that the APS 3200 infringed claims 8 and 19 only under the doctrine of equivalents. (Jury Verdict Form, D.I. 264)

21. On February 16, 2001, the jury found that the APS 3200 APU did not literally infringe any claims of the ‘194 or ‘893 patents, but infringed claim 4 of the ‘194 patent and claims 8 and 19 of the ‘893 patent under the doctrine of equivalents. (Stipulation of Uncontested Facts ¶9, D.I. 388; Jury Verdict Form, D.I. 264)

22. On February 20, 2001, following the jury verdict, the Court entered judgment in Honeywell's favor. (D.I. 265)

23. HSC moved for judgment as a matter of law, asserting, among other things, that Honeywell had failed to present sufficient evidence on which a reasonable jury could find infringement under the doctrine of equivalents. (D.I. 275) One of HSC's arguments was that Honeywell failed to present sufficient evidence on which the jury could conclude that the accused surge control system infringed each of the asserted independent claims under the doctrine of equivalents due to lack of evidence that the use of IGV position in the APS 3200 was equivalent to the "inlet guide vane limitations" of the asserted claims. (*Id.* at 11-19)

24. The Court denied HSC's motion, stating that the infringement verdict was supported, in part, because Honeywell had "introduced evidence at trial from which a jury could conclude that the flow-related parameter used by the APS 3200, DELPQP, was a direct function of inlet guide vane position." *Honeywell*, 166 F. Supp. 2d at 1021.

25. Both Honeywell and HSC appealed portions of the jury verdict to the Federal Circuit. However, Honeywell did not appeal the jury's finding that the APS 3200 did not literally infringe claim 4 of the '194 patent. *Honeywell*, 370 F.3d at 1141 ("Honeywell concedes that the inlet guide vane limitation is not literally met by the accused device.").

26. The Federal Circuit held *en banc* that Honeywell had presumptively surrendered all equivalents to the inlet guide vane limitation and "is presumptively estopped from recapturing equivalents to the inlet guide vane limitation." *Honeywell*, 370 F.3d at 1144. By cancelling the original independent claims that lacked the inlet guide vane limitation and rewriting the asserted claims into independent form, Honeywell "effectively add[ed] the inlet guide vane limitation to the claimed invention." *Id.* The Federal Circuit thus remanded the case for a determination of whether Honeywell could overcome the *Festo* presumption of surrender. *Id.*

27. Honeywell petitioned the Supreme Court to grant *certiorari* to review the Federal Circuit's *en banc* holding. (D.I. 322)

28. While Honeywell's petition was under review, the United States Patent and Trademark Office ("PTO") filed an *amicus* brief with the Supreme Court, requesting that the Court deny Honeywell's petition for *certiorari*. (Ex. 20 to HWL Trial Br.)

29. The Supreme Court denied Honeywell's petition for *certiorari*, and the case was remanded to the District Court. *Honeywell Int'l Inc. v. Hamilton Sundstrand Corp.*, 125 S. Ct. 2928 (2005).

#### **IV. The March 2006 Remand Trial**

##### **A. HSC's Motion *In Limine***

30. Prior to the remand trial, HSC moved *in limine* to preclude Honeywell from offering testimony from a patent lawyer "expert" on the unforeseeability, tangentiality and "other reason" criteria of the *Festo* analysis.

31. At oral argument on that motion, Honeywell conceded that it would not offer expert testimony from its patent lawyer expert in attempting to meet the unforeseeability and tangentiality criteria. Accordingly, the Court granted HSC's motion with respect to the first two *Festo* criteria. (3/1/06 Hearing Tr. at 4, D.I. 400) However, Honeywell contended that expert testimony from a patent lawyer was proper in attempting to establish "some other reason" that Honeywell could not reasonably have been expected to have drafted a claim that literally covered the alleged equivalent. (*Id.* at 4, 22-23)

32. The Court rejected Honeywell's arguments, and precluded Honeywell from presenting expert testimony from a patent lawyer on the "other reason" prong on the *Festo* analysis. *Honeywell Int'l, Inc. v. Hamilton Sundstrand Corp.*, No. 99-309 (GMS), 2006 U.S. Dist. LEXIS 11829, at \*8 (D. Del. Mar. 22, 2006).

**B. The Testimony At Trial**

33. On March 23 and 24, 2006, the Court conducted a two-day bench trial.

34. Based on the Court's ruling, expert testimony at the remand trial was strictly limited to the issue of the foreseeability of the alleged equivalent.

35. Honeywell's technical expert was Mr. Gerard Muller. HSC's technical expert was Dr. David Japikse.

36. Mr. Muller is a mechanical engineer. (Muller, Trial Tr. 117:15-19) Mr. Muller worked at Pratt & Whitney and Exxon before becoming self-employed as an engineering consultant. (*Id.* at 117:20-119:17)

37. As a paid expert witness, Mr. Muller has testified on a variety of subjects besides surge control in compressors, including testing procedures for hydraulic systems, treadmill design, emergency diesel powered generators in sewage treatment plants, a machine to make night goggles and the plastic used in clothes hangers. (Muller, Trial Tr. 160:10-162:3)

38. Mr. Muller has never written a book on diffusers or compressors, the parts of the APU centrally relevant here. (Muller, Trial Tr. 159:2-3, 159:8-10) Mr. Muller has never written an article or presented a paper at an industry conference on diffusers. (*Id.* at 160:4-8) Mr. Muller has written one article on compressors, which related to vibration problems. (*Id.* at 159:15-160:3)

39. Dr. Japikse is a mechanical engineer with over thirty-five years of experience working on turbomachinery (including compressors and diffusers). (Japikse, Trial Tr. 223:7-8) After getting his Ph.D. from Purdue University in 1968, Dr. Japikse spent three years working on airplane engines at Pratt & Whitney (1970-1973), and seven years working on turbomachinery at Creare (1973-1980), which, according to Honeywell's Mr. Muller, is a "well known technology

source in the field of fluid dynamics.” (Muller, Trial Tr. 158:11-22; Japikse, Trial Tr. 224:14-225:19; DX 370)

40. For the last 26 years, Dr. Japikse has run his own company, Concepts NREC, which has 120 employees. (Japikse, Trial Tr. 225:20-226:5; DX 370) Concepts NREC engages in engineering design and development, software writing and manufacturing of turbomachinery. (Japikse, Trial Tr. 226:6-12) Concepts NREC has performed work for a number of aerospace companies, including HSC and Honeywell, as well as Boeing, General Dynamics and others, and has designed compressors that function similarly to the ones at issue in this case. (*Id.* at 226:13-19, 230:24-231:15) Honeywell’s own technical expert, Mr. Muller, called Concepts NREC a “well-known technology source in the area of fluid dynamics.” (Muller, Trial Tr. 158:8-10)

41. Dr. Japikse is also an adjunct professor of mechanical engineering at the University of Vermont, teaching courses in compressor design as well as other subjects. (Japikse, Trial Tr. 227:3-13; DX 370)

42. Dr. Japikse is the incoming chairman of the mechanical engineering section of the National Academy of Engineering, an organization formed by an act of Congress to “be available to ... serve and advise on matters raised by Congress or by the President.” (Japikse, Trial Tr. 227:14-228:18; DX 370)

43. Dr. Japikse has written or edited over 200 publications. (Japikse, Trial Tr. 231:16-22; DX 370) A substantial majority of Dr. Japikse’s publications relate to diffusers and compressors, including several books specifically on those subjects. (Japikse, Trial Tr. 231:23-232:2; DX 370)

44. A majority of Dr. Japikse’s work has related to diffusers and compressors. (Japikse, Trial Tr. 229:17-21) He has “designed whole machines, whole stages, tested them,

built them,” “operated them in laboratories” and “surged them.” (*Id.* at 229:22-230:1) Dr. Japikse has had experience in surge control and lectured on stability and surge control. (*Id.* at 230:14-23, 232:3-14)

45. Dr. Japikse has never testified in Court before this case. (Japikse, Trial Tr. 229:15-16)

46. Two other witnesses testified at trial: Richard Brown and Robert Telakowski. Mr. Brown was one of the developers of the surge control system in Hamilton Standard’s L1011 APU in the late 1960’s and early 1970’s. (Brown, Trial Tr. 379:23-80:14) Mr. Telakowski was knowledgeable about support for that APU through the 1980’s. (Telakowski, Trial Tr. 424:4-25:1)

### **C. The Person Of Ordinary Skill In The Art**

47. The person of ordinary skill in the art in 1982 and 1983 was a person with a “four-year college degree in engineering, combined with at least ten years experience working with control systems for compressors and gas turbines.” (Japikse, Trial Tr. 233:24-234:7; Muller, Trial Tr. 162:7-15)

48. A “person of ordinary skill in the art could include a controls engineer, a mechanical engineer or an electrical engineer,” depending on “the training which they have and their exposure” to control systems. (Muller, Trial Tr. 163:2-8)

49. Although Dr. Japikse is an expert in the technology at issue in this case, at the time of Honeywell’s amendments in 1982-1983, Dr. Japikse had been working in the field of compressors and gas turbines for approximately 14 years since his graduation and thus was closer to a person of ordinary skill at that time. (DX 370)

50. In addition, Dr. Japikse regularly teaches and works with persons of ordinary skill in the art, including colleagues at his company and engineers to whom he lectures, and is

generally familiar with persons of ordinary skill in the art. (Japikse, Trial Tr. 362:10-23) Dr. Japikse's opinions about foreseeability were "expressed from the standpoint of a person of ordinary skill in the art in 1982." (*Id.* at 362:24-363:3)

#### V. The Prosecution History Of The Patents-In-Suit

51. United States Patent No. 4,380,893, entitled "Compressor Bleed Air Control Apparatus and Method," issued on April 26, 1983. (JX 30) United States Patent No. 4,428,194, entitled "Compressor Bleed Air Control Apparatus and Methods," issued on January 31, 1984. (JX 45)

52. All of the system and method claims contained in the '893 and '194 patents were originally contained in a single application, U.S. Patent Application 235,794. As a prosecution formality, the system and method claims were split into two separate applications. The system claims remained in the original application, which issued as the '893 patent. The method claims from the original application were re-filed in a divisional application, U.S. Patent Application No. 424,674, which issued as the '194 patent. (JX 31; JX 33)

53. The independent claims at issue in this remand – claim 4 of the '194 patent and claims 8 and 19 of the '893 patent – trace their history through the prosecution as shown in the table below:

APPLICATION INDEPENDENT CLAIM (REJECTED)	APPLICATION DEPENDENT CLAIM (IGV LIMITATION ADDED)	ISSUED CLAIM, BASED UPON DEPENDENT CLAIM
16	17	8 ('893 PATENT)
32	35	19 ('893 PATENT)
48/49	51	4 ('194 PATENT)

54. Original independent application claims 16 and 32 in the '893 application did not make any reference to inlet guide vane position. (JX 31 at HSB 401434, -439)

55. Original application claims 48 and 49 in the ‘194 application did not make any reference to IGV position. (JX 33 at HSB 401556)

56. In the first Office Action in each application, the Patent and Trademark Office (“PTO”) Examiner rejected original application claims 16, 32, 48 and 49 under 35 U.S.C. § 103 as obvious in light of the prior art. (JX 31 at HSB 401456-57; JX 33 at HSB 401567) As the Federal Circuit explained: “In this case there is no question that the original independent claims (application claims 16 and 32 of ‘893 patent and application claims 48 and 49 of the ‘194 patent) were rejected for reasons related to patentability.” *Honeywell*, 370 F.3d at 1141 (parenthetical in original). The examiner also rejected independent claim 32 pursuant to 35 U.S.C. § 112, because its use of the word “flow” was “not entirely clear.” (JX 31 at HSB 401455-56)

57. In the ‘893 application, original application claim 17 was dependent upon application claim 16, and original application claim 35 was dependent upon application claim 32. (JX 31 at HSB 401435 and 401440) In the ‘194 application, original application claim 51 was dependent upon application claim 49, which was in turn dependent upon application claim 48. (JX 33 at HSB 401556-57)

58. Each of these dependent claims 17, 35 and 51 added a limitation requiring a specific use of IGV position in the surge control system. (JX 31 at HSB 401435, -440; JX 33 at HSB 401556-57)

59. The Examiner stated that dependent claims 17, 35 and 51 would “be allowed if rewritten in independent form.” (JX 31 at HSB 401458; JX 33 at HSB 401567)

60. On October 25, 1982, in response to the Examiner’s office action in the ‘893 application, Honeywell made two amendments. First, it amended the original claims to clarify the use of the word “flow” as it related to the “sensing device,” as the examiner requested

pursuant to § 112. (JX 31 at HSB 401476) This amendment – which Honeywell has characterized as making “minor changes” that are “irrelevant” to the issues on remand – did not add any limitations to the original claims. (Honeywell Opening, Trial Tr. 10:11-15) Rather, it clarified an existing limitation in the rejected independent claim.

61. Second, Honeywell made the amendment that raised the *Festo* presumption at issue by rewriting claims 17 and 35 into independent form, canceling the original independent claims on which they previously depended, and thus “effectively adding the inlet guide vane limitation to the claimed invention.” *Honeywell*, 370 F.3d at 1144; (JX 31 at HSB 401466, -472, -474).

62. In addition, the examiner corrected a typographical error, changing “inlet” to “outlet” to be consistent with the rest of the claim. (JX 31 at HSB 404472) The amended claims issued as claims 8 and 19 of the ‘893 patent. Accordingly, the relevant amendment date for the narrowing amendments of the ‘893 patent is October 25, 1982.

63. On August 30, 1983, in response to the Examiner’s office action in the ‘194 application, Honeywell amended application claim 51 by rewriting it into independent form, canceling the original independent claim on which it previously depended, and thus “effectively adding the inlet guide vane limitation to the claimed invention.”<sup>1</sup> *Honeywell*, 370 F.3d at 1144; (JX 33 at HSB 401573-74) The amended claim issued as claim 4 of the ‘194 patent.

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<sup>1</sup> Application claim 51 was dependent on application claim 49, which was in turn dependent on application claim 48. The examiner rejected both claims 48 and 49 as obvious in light of the prior art. (JX 33 at HSB 401567) Accordingly, the Federal Circuit explained: “In this case there is no question that the original independent claims (application claims 16 and 32 of ‘893 patent and application claims 48 and 49 of the ‘194 patent) were rejected for reasons related to patentability.” *Honeywell*, 370 F.3d at 1141 (parenthetical in original). Neither Honeywell nor HSC contends that any relevant analysis turns on any distinction between the prosecution of application claims 48 and 49. (Honeywell Opening, Tr. 13:12-22; Honeywell Trial Br. at 5, n.1; HSC Trial Br. at 5, n.2)

Accordingly, the relevant amendment date for the narrowing amendment of the '194 patent is August 30, 1983.

64. In sum, as the Federal Circuit recognized: "The only independent claims asserted in this case, claims 4, 8 and 19, were originally dependent on independent application claims 16, 32, 48 and 49, which did not include the inlet guide vane limitation. Claims 4, 8 and 19 included the inlet guide vane limitation. Claims 4, 8 and 19 were rewritten into independent form, and the original independent claims were cancelled, effectively adding the inlet guide vane limitation to the claimed invention." *Honeywell*, 370 F.3d at 1144.

65. The "inlet guide vane limitation" (or "IGV limitation") added by Honeywell's amendments "refers to both the claimed structure of the inlet guide vanes and their claimed function in the surge control system." *Honeywell*, 370 F.3d at 1137 n.2. The IGV limitation is thus expressed in the issued claims as element 8(f) and 19(g) of the '893 patent and element 4(d) of the '194 patent, coupled with the reference to the physical inlet guide vanes themselves in the preamble of the claims. *Id.*

66. The entirety of Honeywell's explanation for the amendments at issue – which effectively added the IGV limitation to the original rejected independent claims in order to overcome the examiner's prior art rejection and gain allowance – is set forth below in the excerpts from the prosecution history of the '893 and '194 patents respectively (JX 31 at HSB 401474; JX 33 at HSB 401574):

### Prosecution History of the '893 Patent

The Examiner has also indicated that Claims 8, 9, 17 and 18 would be allowable if rewritten in independent form, and that Claims 4, 5, 14, 15, 23-26, 30, 31 and 33-36 would also be allowable if rewritten in independent form and amended to overcome certain 35 U.S.C. 112 rejections. By the present amendment Claims 4, 8, 14, 17, 23, 30, 33 and 35 have been rewritten in independent form, and Claims 10, 19, 20, 27, 38, 39 and 40 have been amended to make them dependent from one of these rewritten, allowable claims. Claims 5, 9, 15, 18, 24, 25, 26, and 36, in their originally submitted form, already depend from one of these rewritten claims.

### Prosecution History of the '194 Patent

By the present amendment all the rejected claims have been cancelled without prejudice, and Claims 46, 50 and 51 have been rewritten in independent form as required by the Examiner. (Note that the objected-to Claim 47 was not amended since it depends from the now-independent Claim 46.) Further, two minor typographical errors in the specification were corrected.

67. Honeywell did not provide any explanation of its amendments or its reason for adding the IGV limitation to the asserted claims, other than to meet the requirements of the Examiner to overcome the prior art rejection. (JX 31 at HSB 401461-78; JX 33 at HSB 401570-74)

68. On April 26, 1983, application claims 17 and 35 issued without further amendment as claims 8 and 19 of the '893 patent. (JX 30)

69. On January 31, 1984, application claim 51 issued without further amendment as claim 4 of the '194 patent. (JX 45)

70. A black-lined comparison Honeywell submitted to the Patent Office of issued claim 4 of the '194 patent to application claim 51 shows that the only difference resulting from the amendment is the addition of the IGV limitation (in element 4(d) and the reference to the inlet guide vanes in the preamble). (JX 33 at HSB 401573)

71. Similarly, Honeywell's black-lined comparison of issued claim 19 of the '893 patent to application claim 35 shows that the only difference resulting from the amendment that effectively added dependent claim 35 to the rejected independent claim is the addition of the IGV limitation (in element 19(g) and the reference to the inlet guide vanes in the preamble). (JX 31 at HSB 401472)

72. Honeywell's black-lined comparison of issued claim 8 of the '893 patent to application claim 17 also shows the addition of the IGV limitation (in element 8(f) and the reference to the inlet guide vanes in the preamble). (JX 31 at HSB 401466)

73. The only common limitation added to each of the asserted claims by the relevant amendments was the IGV limitation. The addition of the IGV limitation from the originally-dependent claims was the basis for allowance of asserted claims 4, 8 and 19, and Honeywell narrowed the scope of its original independent claims (which did not include the IGV Limitation) by canceling those claims and rewriting into independent form the dependent claims that included the IGV limitation. *Honeywell*, 370 F.3d at 1144. (JX 31 at HSB 401466, -472; JX 33 at HSB 401573)

74. Along with the asserted claims – each of which requires a specific use of IGV position in the surge control system – the examiner also allowed issued claims 1, 6, 17 and 18 of

the ‘893 patent. Each of those claims did not include the IGV limitation, but included a separate limitation not contained in the asserted claims – a so-called “kicker” feature that responds, when the measured value of the flow parameter falls far below the set point, by disconnecting or interrupting the integral control signal. (*See, e.g.*, JX 31 at HSB 401471 (adding “a kicker ... to deactivate said integral controller ...”); *see also id.* at HSB 401458, 462, 465, 469-470) In each of those claims, the addition of that distinguishing feature – like the IGV limitation in the asserted claims – resulted in the claim’s allowance.

## **VI. The APS 3200 Surge Control System**

75. The APS 3200 APU is a gas turbine engine auxiliary power unit manufactured, used, sold and offered for sale by HSC. (Stipulation of Uncontested Facts ¶8, D.I. 388)

76. The APS 3200 APU was developed through a joint venture between Turbomeca, a French aerospace company, and Sundstrand Corp., a predecessor of HSC. Turbomeca was responsible for designing the load compressor for the APS 3200, and was “primarily responsible for analyzing load compressor behavior, and suggesting bleed control valve software design.” (Feb. 7, 2001 Trial Tr. 537:20-539:18, 553:3-9)

77. The APS 3200 surge control system was developed between late 1989 and late 1993. (Feb. 7, 2001 Trial Tr. 537:12-14) As of October 1989, Sundstrand had conducted no development or testing of that system, and as of March 1990, the control system had not yet been built. (Suttie Dep. 446:14-19, 446:25-447:3, 448:15-22, 449:1-17, 450:15-451:18)

78. The APS 3200 surge control system used a parameter related to air flow known as “DELPQP.” DELPQP is simply short-hand for or “one form” of what is more commonly known as  $\Delta P/P$ , or DELTA-P-OVER-P. “DELP” is short for “DELTA P” (which stands for a change or difference between two pressures), “Q” stands for quotient (or mathematically, “over”), and “P” is pressure. (Muller, Trial Tr. 169:10-23)

79. The  $\Delta P/P$  parameter in the APS 3200 was based upon static pressure measurements taken in the diffuser (near the diffuser throat) and the exit of the scroll. (JX 22 at HSA 96898-99, 96920-23; Muller, Trial Tr. 188:15-189:7)

80. The APS 3200 surge control system encounters what is known as the “inverted-V” or “double solution” characteristic when it experiences supersonic flows. The value of the  $\Delta P/P$  parameter in the APS 3200 initially rises as flow through the compressor increases until it reaches a peak, then the value of the  $\Delta P/P$  parameter in the APS 3200 decreases as the flow rate increases. (Muller, Trial Tr. 133:19-134:6); *see also Honeywell*, 370 F.3d at 1136 n.1.

81. The effect of this inverted-V or double solution characteristic is that for a particular value of  $\Delta P/P$ , there may be two different flow rates that correspond to the  $\Delta P/P$  measurement, a lower flow rate and a higher flow rate. (Muller, Trial Tr. 132:11-134:6)

82. The APS 3200 addressed this double solution behavior by “discriminating between ... the low flow region and the high flow region.” (Muller, Trial Tr. 135:10-19) HSC used “the position of the IGV in order to discriminate what the value of DELPQP is really telling it” because “the opening of the IGV is an indication of how much flow is going through the compressor.” (*Id.* at 135:10-19, 136:24-137:3) Where the test used by the APS 3200 indicates that the flow is high, the surge control system ignores the  $\Delta P/P$  signal to ensure that the surge valve remains closed to the exhaust (*i.e.*, does not bleed air to the exhaust). (Suttie Dep. 144:9-13, 144:19-145:17); *see also Honeywell*, 370 F.3d at 1136.

83. HSC understood that IGV position should be used to address the double-solution behavior within two months of seeing the double solution issue. In an October 1, 1991 memo, one of HSC’s engineers, Pete Suttie asked for views on the “double solution” characteristic contained in the test data. (JX 4) The next month, on November 26, 1991, another engineer sent

a memo that proposed addressing this problem using a test that was based in part upon “IGV setting angle,” or IGV position. This test was referred to as the B-Factor test. (JX 6)

84. HSC later replaced the B-Factor test with the pressure ratio test, which also relied in part on IGV position. (JX 15; JX 39)

85. Both the B-Factor test and the pressure ratio test used IGV position as an input. (DX 133; DX 142; JX 15; JX 19; JX 20; JX 39)

86. HSC replaced the B-factor test because it did not “allow for inaccuracies in the sensors,” in particular the Load Compressor Discharge Temperature sensor; not because of any issue concerning the use of IGV position as an input to address the double-solution issue. (JX 15; JX 19)

## **VII. Honeywell’s Description Of The Equivalent In Connection With The February 2001 Trial**

87. The jury found that HSC’s surge control system infringed under the doctrine of equivalents, in part because it used IGV position in a way that was equivalent to the IGV limitations in the asserted claims. The specific aspect of the APS 3200 surge control system that was found to be equivalent to the inlet guide vane limitations is the subject of this remand. Outlined below is Honeywell’s characterization of that equivalent in connection with the February 2001 trial.

### **A. Summary Judgment Motions**

88. On August 7, 2000, HSC moved for summary judgment of non-infringement. (D.I. 104) HSC argued that it did not infringe under the doctrine of equivalents because in the APS 3200, “[i]nlet guide vane position is not used in determining the set point” (as required by the IGV limitation), but instead the APS 3200 sets the set point based on temperature. (*Id.* at 34)

89. In its response, Honeywell stated that the APS 3200 uses IGV position in “substantially the same manner” as the patent claims: “the position of the inlet guide vanes is an input into the APS 3200’s surge control system” and “the position of the inlet guide vanes can affect operation of the surge bleed valve.” (Hon. Opp. Br. at 17, D.I. 129)

90. In response to HSC’s argument that the APS 3200’s only use of IGV position is in connection with determining whether the APU is operating on the high-flow or low-flow side of the double-solution curve, Honeywell stated that the “inverted-V/double solution” characteristic had “nothing to do with whether or not Sundstrand is using the patented apparatus and method.” (Hon. Opp. Br. at 22-23, D.I. 129; Muller Decl. ¶34, DX 349; Clark Decl. ¶10, DX 350)

91. Based on Honeywell’s arguments and submissions, this Court denied HSC’s motion for summary judgment. *Honeywell*, 2001 U.S. Dist. LEXIS 2155, at \*20.

#### B. Trial

92. At the February 2001 trial, Honeywell based its infringement case largely on the testimony of its technical expert, Gerard Muller. (Feb. 7, 2001 Trial Tr. 557-696)

93. Mr. Muller testified that the APS 3200 satisfied the IGV limitation of the asserted independent claims under the doctrine of equivalents using the function/way/result test. With respect to claim limitation 19(g), Mr. Muller testified that the ***function*** of the use of IGV position in the APS 3200 was to “measure the guide vane position in order to help to, as input to the surge control system.” (Feb. 7, 2001 Trial Tr. 688:22-689:10) The ***way*** used to meet that function was to generate a signal proportional to the movement of the IGV position. (*Id.* at 689:21-690:5) The ***result*** was that the “value of the IGV position is used in the proper operation of the surge control system.” (*Id.* at 690:6-16)